Preliminary Comments from Dr. Helen H. Suh on

EPA's Integrated Science Assessment for Ozone and Related Photochemical Oxidants

(Second External Review Draft – September 2011)

Charge for Chapter 4 - Exposure to Ambient Ozone

Revisions made to Chapter 4 in response to CASAC comments include clarifying the discussion of the relevance of central-site monitoring data for epidemiologic studies, together with potential bias and uncertainty due to exposure error; revising the summary section to be more concise and focused on the main points of the chapter; and preparing tables to summarize field study data and facilitate comparison of exposure models. In addition, material has been added discussing averting behavior on high-03 concentration days.

Please comment on the adequacy of these and other changes in responding to the Panel's comments. Please provide comment on revisions that may further improve the utility of discussion for characterizing personal-ambient exposure relationships and for interpretation of epidemiologic results in subsequent chapters.

General Comments

The revised chapter is a substantial improvement over the previous version. The chapter is a comprehensive, clear, and thoughtful presentation of what is known about ozone exposures and factors that affect exposures. Further, the Chapter does a good job of discussing what research is new since the last review. The emphasis in the Chapter is on short-term exposures (of one day or less), with little discussion of long-term ozone exposures. Although this is understandable given that exposure studies have focused on short-term exposures, it is important to expand the section to include discussions of long-term ozone exposures within each section, especially given the observed associations between long-term ozone exposures and mortality. In addition, some sections, such as the sections on exposure models and exposure error, would benefit from more references.

Specific Comments

Section 4.1

- Page 4-1, line 7: The use of the word "definitive" when referring to existing relevant information from the 2006 O3 AQD is not appropriate. Perhaps "unchanged" or "is still relevant".

Section 4.2

- Page 4-2, line 24-25: I would omit the sentence beginning "F_{inf} is a function of …characteristics." As noted in the next sentence, F_{inf} is a function of several factors in addition to building air exchange rates.
- Page 4-3, line 6: The list of factors contributing to spatial variability should include topography.

Section 4.3

- This section could be expanded to examine personal-ambient associations for weekly, monthly, or seasonal averages, if personal and ambient ozone data from some of the referenced studies could be obtained.
- Page 4-8, line 16: replace "trend" with "levels" or "concentrations".
- Page 4-8, lines 26-34: The impact of exposure averaging periods on the personal-ambient relationship should be discussed, especially given the importance of longer averaging windows to epidemiological studies.

Section 4.4

- Page 4-19, lines 1-15: This paragraph seems misplaced and not needed, as it does not contain any results. It would be better to include results from CHAD that have been reported in a peer-reviewed journal.
- Section 4.4.3: The analysis of proximity is of unclear significance, particularly given the earlier statements. If there is substantial spatial variability introduced by roadways, which exhibit significant variability over small spatial scales, it is likely that proximity would be a poor predictor of a monitor's representativeness. For this section to be useful, data showing how ozone concentrations varies around monitor locations would be helpful. In absence of data, modeling results shown in Chapter 3 could be used to demonstrate whether proximity to monitors matters for population exposures.

Section 4.5

- Page 4-27, lines 13-25: The accuracy and precision of the model should be reported.
- Page 4-27, lines 26-34: The difficulty of using geostatistical and chemistry-transport models to estimate exposures also pertains to all of the outdoor surface models discussed in this section. This paragraph should be expanded to include all of the outdoor concentration models or should be reworked.

- Page 4-32, lines 1-15: This section seems inconsistent with the rest of the exposure chapter, with its discussion of research needs and models under development but not yet published. The discussion of research needs could be reworked to discuss sources of model uncertainty. The discussion of models under development should be deleted, given the ISA's emphasis on peer-reviewed studies should be deleted.

Section 4.6

- Much of the discussion in this section is geared toward the impacts of short-term (e.g., $\leq$24h) exposures. The section would benefit from discussions of the effect of spatial and temporal variability in longer term exposures, for example of one month and on year, especially given the importance of chronic ozone impacts on mortality.
- Page 4-32, lines 32-34: The impact of exposure error on risk estimates is complex, with possible impacts on both the magnitude of the observed estimate but also its standard error; the discussion of this impact should reflect this complexity and include references to support its statements.
- Page 4-33, lines 23-28: Studies supporting this discussion should be referenced.
- Page 4-34, lines 6-34: This discussion pertains to temporal variability, rather than spatio-temporal variability.